THE DEVELOPMENT OF STREET RAILWAYS IN BALTIMORE.

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In the past three-quarters of a century the street railway has grown by gradual stages into a giant system. It has become one of the most indispensable of public institutions, and is intimately associated with the life and progress of nearly every community. No one can trace its development without gaining an appreciation of its usefulness and the efforts made to provide for the comfort of its patrons.

Prior to the inauguration of horse car service, the only means of public transportation was the old omnibus. The average person in going from one point to another had to be content with its discomforts and slowness or walk. Baltimore, in 1858, had a five minute bus service during the business hours on week days. There were no bus lines to either North or South Baltimore, but the service was superfluous in the heart of the city on the prominent streets. To this type of service the city held while other communities were experimenting with the horse car.

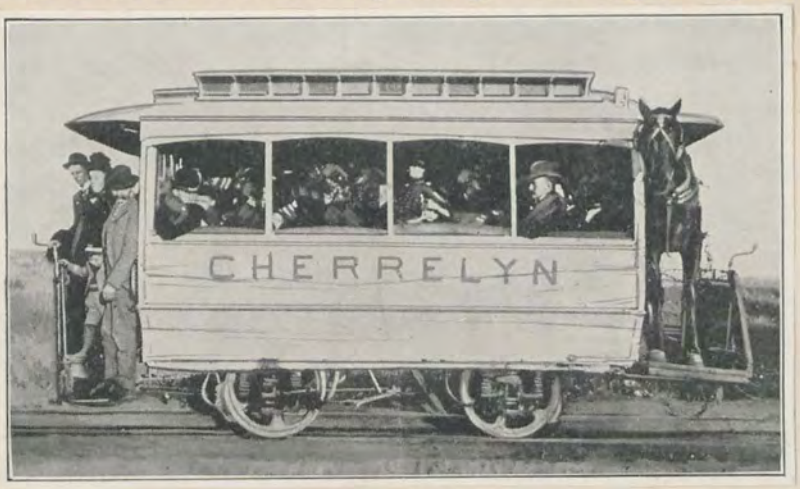
There seems to be no record of a street railway anywhere, before 1831, when New York City had first operated horse cars. Philadelphia had built a line soon afterward, but there was no great activity in street car line construction for 15 or 20 years.

Not until 1859 were the efforts of any company in Baltimore successful in obtaining a franchise for the laying of tracks and the running of cars. In that year the City Passenger Railway was organized and tracks laid for a distance of .66 miles, from the foot of Broadway to Baltimore and North Street. The cars used,although they did have flanged

wheels, were small and light, with a length of only 15 feet and a capacity of less than one-third that of the smallest of present day cars. Sometimes the cars were lighted by a single kerosene lamp, and in winter they were heated by wood stoves. In wet weather and in winter the floors were covered with straw to a depth of a foot or more to keep the passengers' feet warm and dry. Most of the car routes were short, but the cars were driven back and forth over the lines for 18 hours each day.

Many people had expressed grave doubts as to the feasibility of the horse car. Its weight when loaded had been expected to prove too great for a horse either to pull up steep grades or retard when going downhill. Extra horses were used at the steepest grades, and hand brakes were used on the down grades. On a line in Denver the horse was carried on the rear platform when coasting downhill. Many had feared that the frequent derailing of the car would prove a serious handicap. It was found, however, to be so easy for a horse to pull a car back on the track, that the

car was often purposely derailed to go around obstructions. Others had maintained that while it might be possible for an empty car to turn into a cross street, it was mechanically impossible for a loaded car to do so. Some, too, claimed that the rails would curl up under the heavy cars as rails had done on the steam railroads. A few had even expressed opinions that metal rails would attract lightning. The major engineering problems,



however, as in modern times, were closely associated with car construction and operation. In records of car companies of this period may be found very learned studies of such subjects as to whether blond or brunette horses were better suited for street railway service. The decision set down by the best of authorities was in favor of light colored horses for summer and dark ones for winter.

After the inauguration of the first street cars in Baltimore in 1859, lines soon spread until every section of the city had its service. The rewards had proven too great for any single company to long maintain

a monopoly, so the following year had seen many competing companies organized. Less than a year after the first .66 miles of track had been la laid, the city boatsed of 22 miles of track with 65 cars all in active service.

For a quarter of a century after the innovation of the horse car in Baltimore, there was constantly a forward look for the discovery and utilization of more satisfactory forms of power. Thorough studies were made of all suggestions that seemed to have any merit or possibility whatever. During the period many queer modes of transportation were given trials.

Smoke-consuming locomotives were tried on some city lines. In 1876 the Baltimore City Passenger Railway made an effort to substitute steam for horses. A 10 H. P. smoke-consuming steam engine was built and run as an experiment with a passenger car attached. After 60 days, horses were again placed on the line, the experiment proving to be a failure as it had been in other cities.

Much effort was expended in attempts to perfect a gas propelled car, and in experimentation with propulsion by compressed air.

One type of car was termed an hydraulic sliding car. It was equipped with runners, instead of wheels, which rested upon rails in which there were myriads of minute holes through which a film of water was fed. The car was propelled by streams of water fired at paddles on its under surface. Friction was found to be less than with wheels, but the system was found to be unfit for city street usage and too wasteful of water.

A pneumatic railway for under-ground use was tried in London. A car with 30 passengers was blown through an 1800 foot tunnel in one direction and sucked in the opposite direction by means of a 22-foot fan at one end of the tunnel. With a difference in pressure of only 2 1/2 ounces to the square inch, the 1800 feet were traversed in 50 seconds, a rate of 25 miles per hour.

In the period from 1850 to 1875 there had been scarcely any experiments in electric railway operation. The first real suggestion of an electric railway had come from Thomas Davenport who in 1831 had constructed and demonstrated a toy system. In 1851 a small car had been operated on a line running from Bladensburg to Washington, current for the motor being obtained from 100 Grove cells. The car was able to get up to a speed of 19 miles per hour, but the overworked cells soon cracked under the strain. In the period directly following the invention in 1860 of the continuous current dynamo more efforts were directed toward the creation and development of the modern dynamo and motor than to the development of electric street railways. Not until 1879 was there further electric street railway development of much importance. In that year the Siemens firm of Berlin produced a car with a dynamo electric motor taking current from a third rail with track return,and supplied from a stationary dynamo. One car of this type was operated for traffic near Berlin in 1881, this being the first commercial electric railroad.

At this period Leo Daft was one of the more active American workers in electric street railways. In 1885, he equipped two locomotives with electric motors to pull horse cars in Baltimore as an experiment.

The motors were placed low down on the floor of the car and power was transmitted from the armature shaft by a pinion connected with an internal gear on one of the axels. The current was supplied at fairly low potential from a third rail placed midway between the outer rails which served as a return circuit. Speeds up to 12 miles per hour were obtained. by modification of the field windings. At crossings an overhead wire was installed, contact being made by a trolley or transversely hinged arm pr pressed upward by a spring. The power plant consisted of a 35 H. P. steam engine operating 2 dynamos. The experiment was conducted on the Hampden

branch of the Baltimore Union Passenger Railway, a line about 2 miles long running from Hampden to the outskirst of the city. Although the equipment was doubled in 1886, better motors were soon found essential and horse cars were again placed on the line in 1889. This line is generally conceded by authorities to be the first commercially operated electric railway system in this country, and the small sections with overhead trolleys constituted the first overhead trolley system.

The first commercially successful and thoroly equipped American overhead trolley system was established at Richmond, Va., in 1887. The contract called for the completion in 90 days of 12 miles of track, the construction of a complete steam and electric central station of 375 H. P. capacity, and the furnishing of 40 completely equipped acrs each with 2 motors.

Baltimore's first experience with electricity had been unsatisfactory, but it was evident that some form of transportation other than the horse car was necessary to meet a public demand for rapid transit. Electric experiments going on at this time were just beginning to definitely demonstrate the superiority of the electric car over any other form of public conveyance, and the overhead trolley system had begun to make good. Railway engineers, however, were everywhere turning to the cable car.

San Francisco had been the first American city to employ the cable system, a crude type having been constructed in 1873 on a grade found too steep for the use of horses. Cable lines were well adapted to such cities where steep grades were frequent, and lines were soon afterward installed in Philadelphia, Pittsburgh, New York, and other cities. In May, 1891, the Baltimore Traction Company opened on Druid Hill Avenue the first Baltimore cable line.

Cable car operation was dependent upon an endless steel cable running on sheaves within a conduit constructed between the rails. Thru a narrow slat gripping mechanism extended down from the car, seizing or releasing the moving cable thru the operation of a lever on the car. In order to slowly accelerate the car the gripping lever had to be slowly

advanced, gradually reducing the amount of slip until the car reached the speed of the cable. This produced such wear on a cable that breaks were of frequent occurrence. A break caused a suspension of all service for about four hours until the break was located and about fourteen mules obtained to pull one end of the broken cable close enough to the other end to be spliced.

In the old Gilmore Street cable station of the Baltimore Traction Company, two 32" x 60" Corliss engines were used for driving the large cable wheels. The cables were driven at a speed of 11 1/2 miles per hour, one 10,000 feet in length running north and one 22,000 feet long running south.

Cable installation was the most expensive of all surface roads. Even the crude type constructed in San Francisco had cost more than $100,000 per mile. The average cost, however, according to statistics compiled from a number of cities was about $350,000 per mile. A good comparison of the costs of horse, cable, and electric car systems in the period may be obtained from the following figures compiled by the American Railway Association in 1897:

	Electric	Horse	Cable
Interest charge per car mile....	3.03	4.62	6.97
Expenses per car mile.....	11.02	24.32	14.12
Total per car mile.....	14.05	28.94	21.09

Then taking the horse line as the basis for comparison, the following was compiled:

	Electric	Horse	Cable
Investment per mile of track....	1.152	1.000	10.486
Proportionate traffic per mile of track necessary to earn 6%...	0.852	1.000	5.154

It may be seen here that the initial cost of a horse car line was less than 1/10 that of a cable line and slightly less than that of an electric line. The maintenance cost of a horse car line, however, was more than double that of an electric line and considerably greater than that of a cable line. The cable car had to carry approximately 6 times the number of people carried by an electric car, and 5 times the number carried by a horse car to realize the same return on investment. It may be said for the cable car, however, that it was such an improvement over the horse car both in comforts and in speed that it might have attracted sufficient additional patronage to place it on an equal earning basis. It is evident, tho, that the cable system could not possibly compete with the electric street railways.

Although the cable system had its drawbacks, it was an improvement over animal propulsion, and the two leading Baltimore street railway companies accepted it as the most serviceable mode of transportation available, spending more than $10,000,000 in the construction of lines. Twenty rapid transit lines,were opened in Baltimore in the years from 1891 to 1893. But after 1893 there were no new cable lines, the period extending from 1895 to 1899 being taken up with the reconstruction and conversion of the street railways from horse and cable systems to electric power.

In Baltimore the advantages derived from consolidation of street railways had become so evident that there was a gradual tendency in the early nineties toward a more unified control. The various car lines of the city had merged into five separate companies:

Baltimore City Passenger Railway,
Owning 9 lines;

Baltimore Union Traction Company,
Owning 14 lines;

City and Suburban Railway Company,
Owning 9 lines;

Lake Roland Elevated Railway Company,
Owning 3 lines;

Central Railway Company,
Owning 1 line.

Further consolidation took place in 1894 and in 1897, and in 1899 the four existing companies were all combined under the name of the United Railways and Electric Company. Of these four companies, the City Passenger Railway owned 110 miles of track, the Baltimore Consolidated Railway Company owned 200 miles, the Baltimore and Northern Railway owned 40 miles, and the Baltimore, Middle River, and Sparrows' Point Railway owned 15 miles of track.

Since the merger into one company the street railways of Baltimore have taken tremendous strides, particularly so in the past few years since the World War.

Seven hundred and fifty (750) cars were operating daily in 1909. End to end they would have stretched for 6 miles. Two old type Madison Avenue and the Carey Street cars each had two motors of 55 H. P.

each. The Druid Hill cars had two motors of 40 H. P. each. The Gilmore Street open cars had two motors of only 30 H. P. each, the weakest equipment in the city. The two truck semi-convertible street car had four motors of 55 H. P. each. All cars could attain speeds of 30 miles an hour or more, and the Bay Shore cars could reach a speed of 55 miles per hour.

By 1916 895 cars had been put in operation since the fire of 1904, 745 being of the double truck semi-convertible type.

In 1922 1,378 cars were owned and the average number in daily use during the morning rush was 1,020, during the evening rush hour 1,135, and between the rush hours, 500. Since 1900 1,135 new cars had been obtained and 620 had been reconstructed since 1916.

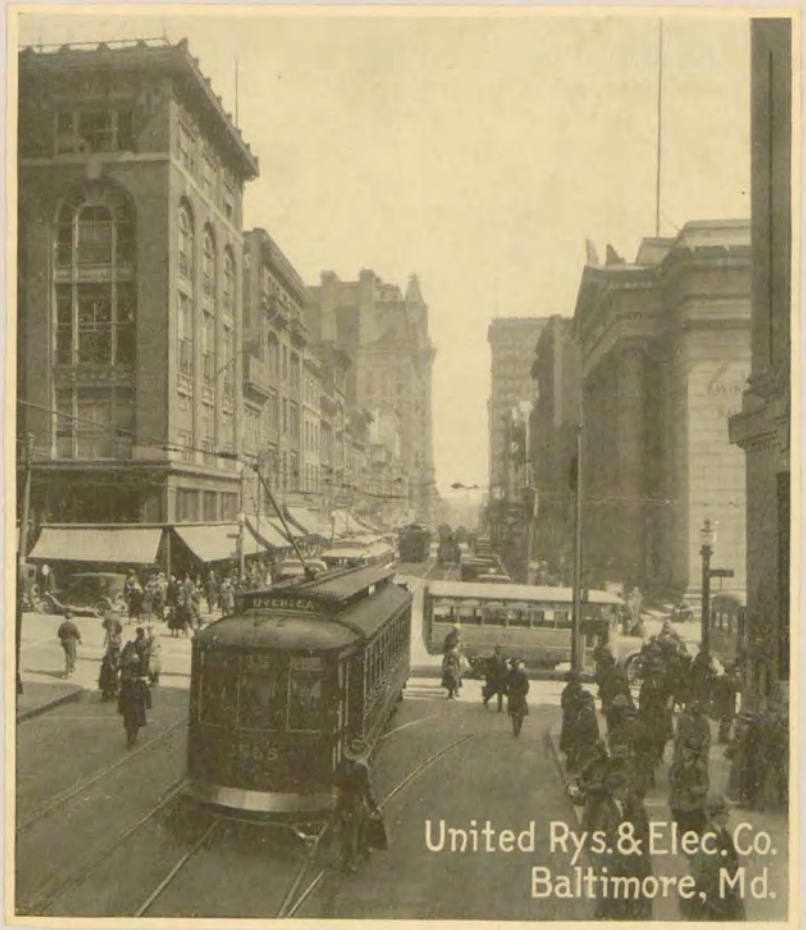
The multiple unit system of control used on the cars of the Bay Shore Line was conceived by Sprague. A six-car train had first been operated on this principle by the General Electric Company on their tracks at Schenectady in 1897. By multiple unit control any number of identical cars may be combined into a train unit and the controllers of each operated simultaneously by a master switch on one car. This system has proven to be of great importance in dense rapid transit service like the elevated and subway in New York City where enormous carrying capacity is essential.

In order to keep pace with invention and give the public the most modern and up to date equipment available, the United Railways and Electric has since 1900 been remodeling or discarding old type equipment. Much property obtained with an estimated life of 20 years has within 5 years been sent to the scrap heap.

Originally small single truck cars had been large enough to meet the requirements. As late as 1905 the company had purchased 150 of

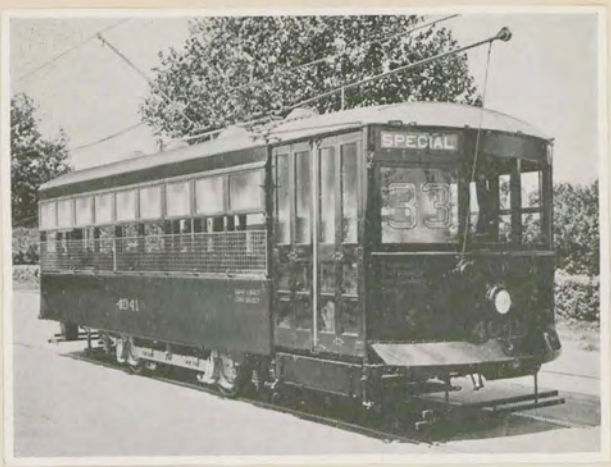
this type each equipped with two motors. These have been gradually supplanted by longer double truck cars. This type, called the Standard car, is today the most generally used on the Baltimore system for all around city service. It has a length of 52' and seats 52 people. It weighs 24 tons and is driven by four 55 H. P. Motors.

Center entrance trailers were first used in Baltimore in 1920, 100 then being obtained and gradually introduced. This type of car has proven highly successful during the heavy traffic periods, producing economics in both platform labor and in power consumption. These cars not only have a greater capacity than the standard cars, but are lighter as they contain no motors.



In the past few years a one-man car has been developed. With it has come additional safety, great reduction in the cost of labor, and more rapid acceleration and deceleration. In 1921, 65 one-man cars of the Birney safety type were added to the Baltimore system. These cars seat 32 people, are 28' long, weigh 8 tons and are driven by 2 25 H. P. inter-pole motors.

Still more recently a trackless trolley has come into use, not only doing away with the expensive installation of tracks but having the



additional advantage of using power transmitted over a wire rather than carry its supply along in the form of gasoline.


BALTIMORE and VICINITY
THE UNITED RAILWAYS & ELEC. CO.
EMORY GROVE
LAKESIDE
TOWSON
HAMILTON
OVERLEA
WOODLAWN
NILLSDALE
GWYNN OAK AVE.
LIBERTY HEIGHTS AVE.
BELVEDERE AVE.
UNION AVE.
FALLS ROAD
ROLAND AVE.
UNIVERSITY PARKWAY
CHESTNUT
HUNTINGDON AVE.
25th ST.
YORK ST.
BELAIR ROAD
NORTH AVE.
FULTON AVE.
RETREAT AVE.
WHITELOCK
CALLOW AVE.
CUMBERLAND
MADISON
DRUID HILL AVE.
LINDEN AVE.
CHILTON ST.
DOLPHIN ST.
BIDDLE ST.
MARYLAND AVE.
ST. PAUL ST.
CHARLES ST.
GUILFORD AVE.
GREENMOUNT AVE.
AISQUITH ST.
CENTRAL AVE.
FEDERAL ST.
PRESTON ST.
WASHINGTON AVE.
MILTON AVE.
PARK AVE.
ASHLAND AVE.
MONUMENT ST.
ORANGEVILLE
POPLAR GROVE ST.
LANVALE ST.
EDMONSON AVE.
FRANKLIN ST.
SARATOGA ST.
HOWARD ST.
EUTAW ST.
PACA ST.
GREEN ST.
CALVERT ST.
HOLLIDAY ST.
GAY ST.
ORLEANS ST.
FAYETTE ST.
BALTIMORE ST.
FAIRMOUNT AVE.
CAROLINE ST.
WOLFE ST.
EAST AV.
3rd ST.
7th ST.
8th ST.
MIDDLE RIVER
ELLICOTT CITY
FREDERICK ROAD
PRATT ST.
LOMBARD ST.
COLUMBIA AVE.
PRICE ST.
CONWAY ST.
LEE ST.
HAMBURG ST.
BROADWAY
GOUCH ST.
BANK ST.
EASTERN AVE.
PATTERSON
ALICEANNA ST.
LANCASTER ST.
SHAKESPEAR ST.
KENWOOD AV.
HUDSON ST.
ELLIOTT ST.
TOONE ST.
12th ST.
4th ST.
WILKENS AVE.
COLUMBIA AVE.
RIDGELY ST.
OSTEND ST.
CHARLES ST.
LIGHT ST.
FORT AVE.
CROMWELL ST.
MORRELL PARK
HALETHORPE
PATAPSCO RIVER
PATAPSCO AVE.
FORT HOWARD

These cars may be operated off center, enabling them to load passengers from the curb and to move around obstructions that might otherwise cause delays. Three cars were installed in 1922 by the United Railways on a macadam road running to an outlying district where the prospective patronage was small. Each car seats 30 people and is equipped with Westinghouse foot control. The 6.3 miles are run in 25 minutes.

It was thought but a few years ago that a maximum had been reached in the size of a single car by the double truck type. Clearance on curves and several other factors suposedly made larger cars impossibilities. Increased traffic demands were then met by coupling two or more cars together in trains. But more recently the "Jointed" or "Articulated" car has been developed. In Baltimore two standard double truck cars were joined at the center on a third truck which took the place of the two original trucks at the center. The cars rebuilt in this manner in 1924 are 75' long and seat 87 people. This type of unit is really but a single car with hinged joints to permit passage around curves.

The street cars of Baltimore now carry daily passengers equal to the City's population which has doubled since 1899. In 1922 325,000,000 passengers were carried, or about three times the population of the United States, and an increase of about 130,000,000 over the number of passengers carried in 1908. The transfers issued totalled over 109,000,000; that is, one out of every three asked for transfers. Stretched end to end these transfers would reach more than half way around the earth, and piled flat they would make a stack more than 9 1/2 miles high. The cars ran more than 35,000,000 miles, 9,000,000 more than in 1908, and daily a distance equal to four times around the earth.

In 1899 the company operated 350 miles of single track, but

by 1909 there were over 400 miles, 188 miles reconstructed since the merger, chiefly with 9" girder rails. There were 237 miles of city lines, 215 miles being on paved streets, and only 19 miles built with T rails. Between the fire of 1904 and 1916 the United Railways reconstructed the larger portion of the main city lines and rebuilt more than half of its tracks in the outlying districts. There were over 415 miles of track in 1922, enough to make a double track line from Baltimore to New York City.

Since the time of the first horse cars, no Baltimore street railway company has been permitted to lay tracks or operate cars unless a fixed percentage of the gross receipts was paid to the city for erection and maintenance of public parks and squares. In 1855 when the omnibus was far past the experimental stage, the city of Baltimore was only able to expend $6,000 on the parks. But in 1860, the first year after horse cars were started, Druid Park was bought, the city spending nearly $58,000 on parks and squares, $33,000 being received from the street railways. By 1865 the park expenditures were more than $153,000, and today the city boasts of 2,500 acres of the finest parks for national beauty in the country. In 1922 the gross receipts of the street railways were about $16,000,000, the city receiving $1,740,000 or 11% as taxes. Since the United Railways and Electric Company was formed the city has received from the company in park taxes more than $15,000,000, and more than $22,000,000 have been received for taxes and public charges combined. Not only does the United Railways and Electric Company pay a park tax of 9%, and licenses fee of $5 per car, but it must maintain the paving between its tracks and 2' on either side. The tracks, incidentally are 5' 4 1/2" between rails or 8" greater than standard gauge in order for wagons to run along the rails rather than over the cobblestone

streets. Where the tracks are double, a strip of paving 20' wide running parallel to the length of the track, or an aggregate of 11,363 sq. yds. of street area per mile must be maintained by the street railway.

All these facts are significant because they show the efforts of an organization to keep pace with modern scientific invention and to satisfy the increasing demands of an increasing population. The consequent achievements in street railway transportation are the more remarkable and interesting because they concern a street railway system of a Maryland city. Few street railways can claim such rapid growth in the past quarter of a century or show today evidence of such highly efficient service as the United Railways and Electric Company of Baltimore.